

Linde Gas



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MATERIAL  
SAFETY  
DATA SHEET  
No. 16

## SECTION 1. PRODUCT INFORMATION

NAME : Carbon Dioxide, Refrigerated Liquid

TRADE NAME AND SYNONYMS: Bulk Carbon Dioxide; Carbon Dioxide, Refrigerated Liquid (D.O.T.)

APPEARANCE AND ODOR: Colorless, odorless gas

CHEMICAL NAME AND SYNONYMS : Liquefied (Refrigerated) Carbon Dioxide

CAS # : 124-38-9

DOT I.D. No : UN 2187

DOT HAZARD CLASS : Division 2.2

CHEMICAL FORMULA : Liquid (Refrigerated) CO<sub>2</sub>

CHEMICAL FAMILY : Carbonate

ISSUE DATE AND REVISIONS : Revised April 2006

## SECTION 2. HEALTH HAZARD DATA

EMERGENCY OVERVIEW : Carbon Dioxide (gas) is non-flammable and is 1½ times heavier than air.

When the cryogenic liquid is discharged from its container it emerges as a liquid which quickly converts to a mixture of dry ice "snow" and vapor. Continuous dermal contact with this cold snow could result in frostbite or cryogenic "burns".

Inhalation: Low (3-5 Molar%) concentrations cause increased respiration and headache. Moderate (8-15 Molar%) concentrations cause headache, nausea and vomiting which may lead to unconsciousness if not moved to open air or given Oxygen. High concentrations cause rapid circulatory insufficiency leading to coma and death.

TIME WEIGHTED AVERAGE EXPOSURE LIMIT : Carbon Dioxide has a TWA of 5,000 Molar PPM and an STEL of 30,000 Molar PPM (ACGIH 2005). OSHA 2005 lists a PEL (8 hr. TWA) of 5,000 Molar PPM for Carbon Dioxide

TOXICOLOGICAL PROPERTIES : Carbon Dioxide is the most powerful cerebral vasodilator known. Inhaling high concentrations causes rapid circulatory insufficiency leading to coma and death. Chronic, harmful effects are not known from repeated inhalation of low (3-5 Molar %) concentrations.

Frostbite effects are a change in the color of the skin to gray or white possibly followed by blistering.

Carbon Dioxide is not listed in the IARC, NTP or by OSHA as a carcinogen or potential carcinogen. Persons in ill health where such illness would be aggravated by exposure to Carbon Dioxide should not be allowed to work with or handle this product.

RECOMMENDED FIRST AID TREATMENT : PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO CARBON DIOXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

## **SECTION 2. HEALTH HAZARD DATA, (CONT'D)**

**RECOMMENDED FIRST AID TREATMENT, (CONT'D):** Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given assisted respiration and supplemental Oxygen. Further treatment should be symptomatic and supportive.

Frostbite: Flush effected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

## **SECTION 3. FIRE AND EXPLOSION HAZARD DATA**

**FLASH POINT (METHOD USED):** N/A

**AUTO IGNITION TEMPERATURE:** N/A

**FLAMMABLE LIMITS (% BY VOLUME)** LEL = N/A UEL = NA

**EXTINGUISHING MEDIA:** Nonflammable gas

**SPECIAL FIRE FIGHTING PROCEDURES:** N/A

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** If cylinders are involved in a fire, safely relocate or keep cool with water spray.

## **SECTION 4. SPILL OR LEAK PROCEDURES**

**SPECIAL NOTE:** Carbon Dioxide, Refrigerated Liquid is delivered to a customer into stationary vacuum-jacketed vessels at the customer's location. These stationary vessels may have mechanical refrigeration coils within the vapor space in order to maintain the pressure in the vessel or the temperature of the liquid in the vessel.

Stationary customer-site vessels should be operated in accordance with the manufacturer's and your supplier's instructions. Do not attempt to repair, adjust or in any other way modify the operation of these vessels. If there is a malfunction or other type of operational problem with the vessel, contact the closest supplier location immediately.

This product is also delivered to users in transportable cryogenic containers (liquid cylinders). These cylinders should only be used in well-ventilated areas and in accordance with the manufacturer's and your supplier's instructions. These cylinders must always be kept in an upright position. Specialized hand trucks are needed for their movement. A "first in – first out" inventory system should be used with these cylinders.

## **SECTION 5. HAZARDOUS MIXTURE PRECAUTIONS**

Forms Carbonic acid in the presence of water

## **SECTION 6. REACTIVITY DATA**

STABILITY : Stable

CONDITIONS TO AVOID : None

INCOMPATIBILITY (MATERIALS TO AVOID) : None

HAZARDOUS DECOMPOSITION PRODUCTS : Carbon Monoxide

HAZARDOUS POLYMERIZATION POTENTIAL : Will not occur

CONDITIONS TO AVOID : None

## **SECTION 7. SPECIAL PRECAUTIONS\***

SPECIAL LABELING INFORMATION : DOT Shipping Name: Carbon Dioxide, Refrigerated Liquid

DOT Shipping Label : Nonflammable Gas

DOT Hazard Class: Division 2.2

I.D. No.: UN 2187

SPECIAL HANDLING RECOMMENDATIONS : See Special Note in Section 4

For additional handling recommendations, consult Compressed Gas Association's Pamphlets G-6, G-6.1, "Standard for Low Pressure Carbon Dioxide Systems at Consumer Sites", G-6.2 and G-6.3.

SPECIAL STORAGE RECOMMENDATIONS : See Special Note in Section 4

For additional storage recommendations, consult Compressed Gas Association's Pamphlets G-6, G-6.1, "Standard for Low Pressure Carbon Dioxide Systems at Consumer Sites", G-6.2 and G-6.3.

SPECIAL PACKAGING RECOMMENDATIONS : For assistance in designing Liquefied Carbon Dioxide systems, contact your supplier. Dry Carbon Dioxide can be handled with most common structural materials. Moist Carbon Dioxide is corrosive by its formation of carbonic acid. For these applications, 316, 309, and 310 stainless steels may be used as well as Hastelloy® A, B, and C and Monel®. Ferrous nickel alloys are slightly corroded. At normal temperatures Carbon Dioxide is compatible with most plastics and elastomers

\*Various Government agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

## **SECTION 8. SPECIAL PROTECTION INFORMATION**

RESPIRATORY PROTECTION : Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use

VENTILATION : See Local Exhaust

LOCAL EXHAUST : To prevent the accumulation above the TWA

SPECIAL : N/A

MECHANICAL : N/A

OTHER : N/A

PROTECTIVE GLOVES : Loose fitting, insulated

EYE PROTECTION : Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT : Safety shoes

## **SECTION 9. PHYSICAL DATA**

BOILING POINT: Sublimation Point = -109.3°F (-78.5°C)

LIQUID DENSITY AT BOILING POINT: Solid Density = 97.5 lb/ft<sup>3</sup> (1562 kg/m<sup>3</sup>)

VAPOR PRESSURE: @ 70°F (21.1°C) = 856 psia (5900 kPa)

GAS DENSITY AT 70° F, 1atm: 0.114 lb/ft<sup>3</sup> (1.83 kg/m<sup>3</sup>)

SOLUBILITY IN WATER: Very soluble

FREEZING POINT: -69.8°F (-56.6°C) @ 75.1 psia (518 kPa)

EVAPORATION RATE: Varies with condition of container insulation.

SPECIFIC GRAVITY (Air =1): @ 70°F (21.1°C) = 1.52

## **SECTION 10. ADDITIONAL RECOMMENDATIONS OR PRECAUTIONS:**

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, enclosed vans, truck cabs or in passenger compartments. Transport cylinders secured in open flatbed or in open pick-up type vehicles.

Reporting under SARA, Title III, Section 313 not required.

NFPA 704 No. for Liquid (refrigerated) Carbon Dioxide = 3 (Health) 0 (Flammability) 0 (Instability)  
None (Special)

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